



Inventory & Monitoring Program

Pacific Island Network

Monitoring Plan

Supporting Documents: National Park of American Samoa Resource Overview

Prepared by Rise Hart

30 September 2004

Pacific Island Network (PACN)

Territory of Guam

War in the Pacific National Historical Park (WAPA)

Commonwealth of the Northern Mariana Islands

American Memorial Park, Saipan (AMME)

Territory of American Samoa

National Park of American Samoa (NPSA)

State of Hawaii

USS Arizona Memorial, Oahu (USAR)

Kalaupapa National Historical Park, Molokai (KALA)

Haleakala National Park, Maui (HALE)

Ala Kahakai National Historic Trail, Hawaii (ALKA)

Puukohola Heiau National Historic Site, Hawaii (PUHE)

Kaloko-Honokohau National Historical Park, Hawaii (KAHO)

Puuhonua o Honaunau National Historical Park, Hawaii (PUHO)

Hawaii Volcanoes National Park, Hawaii (HAVO)

<http://science.nature.nps.gov/im/units/pacn/monitoring/plan/>

EXECUTIVE SUMMARY AND INTRODUCTION

The National Park of American Samoa (NPSA) was established in 1988 with park units on the islands of Tutuila, Ofu and Ta'u in the Territory of American Samoa. However, the park was not implemented until 1993 when land lease arrangements were finalized. The primary purpose of the park is to maintain the ecological balance of the Samoan tropical forest and protect the archeological, cultural, and coral reef resources.

American Samoa (14S, 168-173W) lies south of the equator in the central South Pacific Ocean and consists of five volcanic islands (Tutuila, Aunu'u, Ofu, Olosega, Ta'u). The climate is hot, humid, and rainy year-round. Hurricanes hit the island occasionally; the most recent was in 2004. The territory's population in 2002 was about 60,000 and growing rapidly. Principal sources of revenue are federal grants and two of the world's largest tuna canneries.

The paleotropical rainforests and Indo-Pacific coral reefs are unique features of NPSA. There is low diversity and high endemism of terrestrial species due to the island's remoteness. The marine environment, however, is highly diverse with about 900 fish and 200 coral species.

The archeological and historical sites at NPSA comprise of oral history including myths/legends, traditional medicines, and the Samoan culture itself. NPSA must exert care in preserving these cultural elements.

NPSA's management priorities include the control and/or eradication of invasive species, particularly alien plants, feral pigs, rats, and snails. Other management concerns include the expansion of agricultural plantations within the park and the impacts on rare bird and bat species. A major marine environment issue is addressing impacts of climate change on coral reefs. Because of increasing water temperatures, NPSA is experiencing an increased incidence of coral bleaching and disease. Other resource concerns include overharvesting of fish, threatened and endangered sea turtles, and marine and stream water quality.

To track NPSA's natural resources management issues, there are several inventory and monitoring projects that are being conducted within the park by NPSA or other agencies or contractors. Existing inventory projects at NPSA include inventories of seabirds, bats, fish species, insects, land snails/slugs, plants, vegetation, marine invasive species, and corals. Monitoring projects include forest bird and bat surveys and feral pig activity. Invasive tree and plant distribution and monitoring are currently being initiated. In the future, NPSA plans to conduct inventories on marine fish and invertebrates and insects in all park units. A high priority for both terrestrial and marine programs is to develop a vital signs monitoring program to track changes in time.

Enabling Legislation

The National Park of American Samoa was established in 1988 by PL 100-571 with park units on the islands of Tutuila, Ofu and Ta'u in the Territory of American Samoa. The park's purpose is "to preserve and protect the tropical forest and archeological and cultural resources of American Samoa, and of associated reefs, to maintain the habitat of

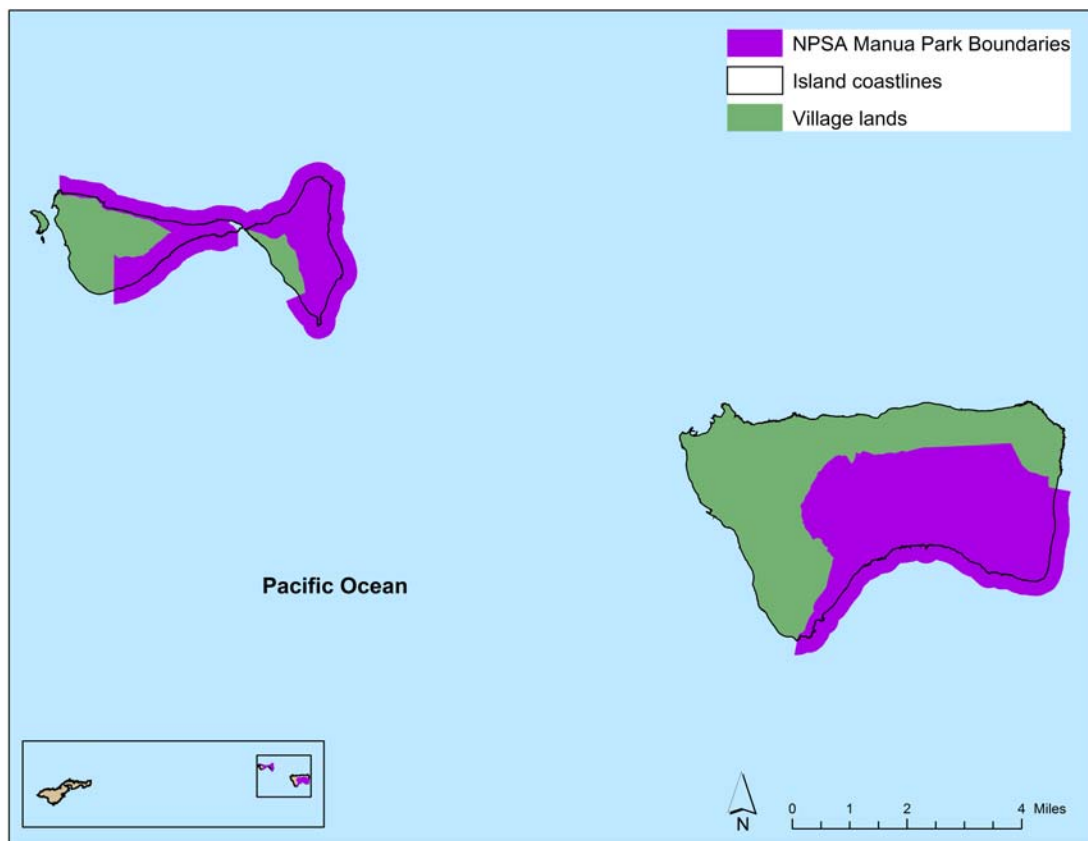
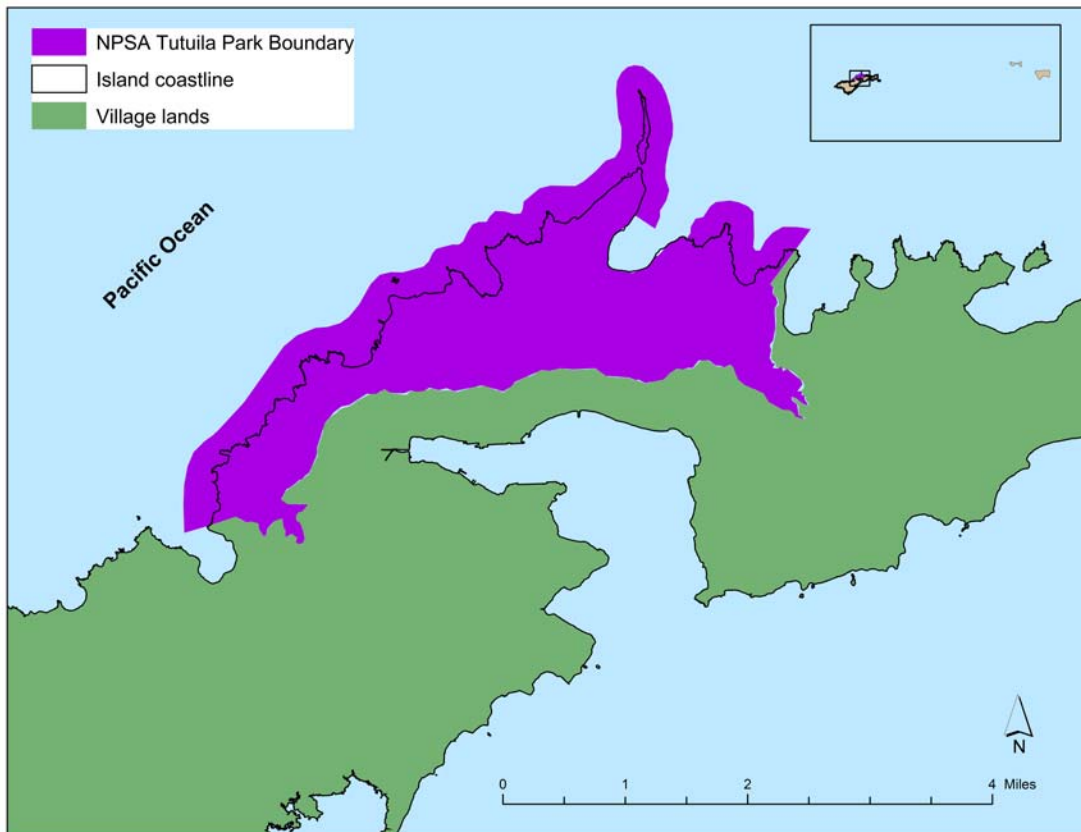
flying foxes, preserve the ecological balance of the Samoan tropical forest, and, consistent with the preservation of these resources, to provide for the enjoyment of the unique resources of the Samoan tropical forest by visitors from around the world". Because the Park could not purchase land outright due to traditional communal land system, it was not until 1993 that the park became legally established with a 50-year lease agreement. This agreement, involving lands within eight villages, enabled National Park Service (NPS) to begin managing lands and waters within the leased premises for National Park purposes. The park consists of 7,970 acres of land and 2,550 marine acres (NPSA's boundary extends 0.25 miles offshore where water depths are about 100 ft). In 2002, Congress approved a 30% expansion on Olosega and Ofu islands.

To find enabling legislation documents on-line follow the "Policy & Legislation" link from the Pacific Island Network website (www1.nature.nps.gov/im/units/pacn).

Geographic Setting

American Samoa (14S, 168-173W) lies south of the equator in the central South Pacific Ocean. The main volcanic islands form a chain created as the ocean floor (Pacific Plate) glides over a stationary "hotspot" beneath the earth's crust. Secondary volcanism occurred as recently as 90 and 120 years ago in the archipelago. The islands are small and steep, ranging in size from the populated island of Tutuila (145 km²) to the smaller and sparsely populated islands in the Manu'a group (Ofu, Olosega, Ta'u; see map below). A maritime climate of tropical heat and rain prevails year-round. Hurricanes hit periodically, the last five occurring in 1966, 1986, 1990, 1991, and 2004. The territory's population in 2004 is about 62,000 and growing rapidly (2.1% per year), with 96% of the population living on the southern side of Tutuila Island. Principal sources of revenue are federal grants and two of the world's largest tuna canneries (which process tuna caught elsewhere in the Pacific). Together, the government and canneries employ two-thirds of the work force, over half of which was born outside of American Samoa, mostly from neighboring (western) Samoa. Other territorial or federal agencies in American Samoa are the Department of Marine and Wildlife (DMWR), Fagatele Bay National Marine Sanctuary (FBNMS), American Samoa Environmental Protection Agency (ASEPA), Historic Preservation Office, Department of Commerce, and Land Grant. These agencies also conduct inventory and monitoring projects, sometimes the projects are within the park boundaries.

Pacific Island Network, Monitoring Plan



Significant Natural and Cultural Resources

NPSA's paleotropical rainforests and Indo-Pacific coral reefs are unique to the NPS system, along with War In The Pacific National Historical Park (WAPA) located in Guam. The diversity of terrestrial species is low due to the isolation of the Samoan islands. Approximately 30% of the plant and one bird species are endemic to the archipelago. The only native mammal species are the large pteropid fruit bats (flying foxes) that play an important role in forest pollination. Other important biota resources are birds, reptiles, and stream ecosystems. The marine system, in contrast, is highly diverse with about 900 fish and 200 coral species, as well as rare and endangered sea turtles and humpback whales. Over a hundred nearshore species are harvested for food (fish, giant clams, octopus, palolo, and other invertebrates).

The Samoan culture (Fa'asamoa) is of major significance. The environment intertwines with the fa'asamoa. Many Samoan proverbs, names, chief titles originated from the Samoan names for plants, birds, fish, air, and clouds. The archeological and historical sites at NPSA comprise of oral history including myths/legends, traditional medicines, and the Samoan culture itself.

Resource Management Priorities

A major terrestrial priority is the control and/or eradication of invasive species, particularly alien plants (over 200 species) and feral pigs, but also introduced snails, slugs, and rats. It is essential to deal with this problem while it is still feasible, rather than wait for invasion to escalate like in Hawaii. In the marine environment, a major issue is addressing impacts of climate change on coral reefs. The park is experiencing an increased incidence of coral bleaching and disease that is associated with increasing water temperatures. Identification of temperature-tolerant corals (such as those in Ofu lagoon), and research on why such corals are temperature-tolerant is needed. Other major marine issues include overfishing, crown-of-thorns starfish damage to corals, and the demise of sea turtle populations in our region. A high priority for both terrestrial and marine programs is to develop a vital signs monitoring program to track changes over time.

Protection and preservation of the park's tropical forests is of great importance since tropical forests are declining worldwide. The success of this depends greatly on working with local villages on resource-related matters such as agriculture practices within the park. As well as plantation management within the park, including illegal expansion or creation of plantations and the impacts on rare species (e.g., sheath-tailed bat, Pacific boa, spotless crane) along with detrimental agricultural practices (e.g. farming practices that facilitate erosion).

NATURAL RESOURCES

Focal Ecosystems and Processes

- Mixed Paleotropical Rainforest
- Forest Pollinators (flying foxes and land birds)
- Focal Invertebrates (coconut crabs and land snails)
- Seabirds (20 species)
- Rare Species (sheath-tailed bat, Pacific boa, spotless crane, fruit dove)
- Indo-Pacific Coral Reef Ecosystem
- Relatively Pristine Waters
- Coral Diversity and Density
- Coral Reef Fishes
- Sea Turtles (endangered species)
- Humpback Whales (endangered species)

Vegetation: A distinctive feature of NPSA is that it's the only mixed species, paleotropical rainforest in the National Park Service system. NPSA's flora encompasses 471 native flowering plants and ferns and over 100 endemic plant species. Notable forest resources include a nearly undisturbed cloud forest in the Ta'u unit and the largest remnant of intact lowland ridge forest in the Samoan Archipelago in the Tutuila unit (Whistler 2002).

Terrestrial Vertebrates: Important wildlife species include nectarivorous and frugivorous bird and bat species, which fulfill an essential role in the ecosystem as forest pollinators and assist in maintaining the structure and diversity of the rainforest.

There are 20 species of seabirds nesting in American Samoa. The Tahiti Petrels, estimated to be in the thousands live on the Ta'u Island unit of the National Park.

Terrestrial invertebrates: The territory includes 42 native land snail species. One of the species is extremely rare *Samoana conica* and is found only in Tutuila and seven are threatened or endangered as previously stated.

There are coconut crab living in the territory; however not much is known about them and they are usually harvested when seen.

Marine Communities: Marine resources are highly diversified with corals (200 species) and fish (900 species). Little is known about other marine mammals in the territory.

Water Quality: The overall marine waters are generally clean due to tidal flushing; however some beach areas experience intermittent closure due to contaminated stream runoffs.

Threatened and Endangered Species: Two endangered species of sea turtle, the green (*Chelonia mydas*) and the hawksbill (*Eretmochelys imbricata*), are found in the territorial

waters of American Samoa. Both species are described as critically endangered by the US Recovery Team.

Humpback whales (*Megaptera novaeangliae*) migrate here to mate and to birth their young. They are currently listed as an endangered species because of world-wide population declines.

Candidate species on the Federal Threatened and Endangered Species List include the Tutuila Tree Snail (*Eua zebrina*), the Fragile tree snail (*Samoana fragilis*), the spotless crake (*Porzana tabuensis*), the many-colored fruit dove (*Ptilinopus perousii perousii*), and the sheath-tailed bat (*Emballonura semicaudata semicaudata*). Additional details on some of these candidate species is presented in the Rare species section below.

Rare species: Rare species of American Samoa include the sheath-tailed bat, which was almost eliminated by Hurricane Val in 1991, the spotless crake, a forest bird not seen on Ta'u since 1986 but recently found on Mt. Lata (O'Connor and Rauzon 2003), the beautiful many-colored fruit dove, one of the rarest birds in Tutuila with an estimated population size of 80 birds, and the Pacific boa (*Candoia bibroni*), which is only found on Ta'u Island. Rare land snails in the Territory include *Ostodes strigatus*, *Samoana abbreviata*, *Samoana conica*, *Samoana thurstoni*, and *Trochomorpha apia*.

Threats & Stressors

- Alien invasive species
- Global warming causing coral bleaching and changes in species distribution and abundances
- Overfishing
- Hurricane damage
- Rapid population growth
- Expansion of agricultural plantations into primary forest

Vegetation: The expansion or creation of new plantations in the NPSA's forests causes losses of primary forest habitats.

Invasive Species: Invasive species pose the largest threat to the persistence of native species and biodiversity throughout the South Pacific. There are several invasive species in the territory: toads, giant African snails, rosy wolf snails, mile-a-minute vine, lopa trees, tamalini palagi trees, myna birds, feral pigs, and rats. NPSA's emphasis on managing invasive plants and animals is a high priority. The focus will initially be on reducing the feral pig population, monitor rat abundance, and removal of tamalini palagi.

Climate: Tracking of global warming and climate changes (causing coral bleaching) is very important to NPSA coral reefs. Warmer temperatures are already causing coral bleaching and mortality, with associated increases in coral diseases.

An area of concern for NPSA is hurricane destruction causing environmental changes (e.g., 1991 hurricane virtually eliminated the sheath-tailed bat population).

Fish Resources: The decrease in the fish size and population due to overfishing is a serious problem in NPSA and throughout the territory.

Population Growth: Human population growth is a serious problem (e.g., loss of habitat buffer or reservoirs, potential degradation of air quality, water quality). As previously mentioned, the park area is leased from surrounding villages. Thus, subsistence use of land and water resources is allowed which contributes to erosion from agricultural use.

Water Quality Designations

Similar to Hawaii, American Samoa designates areas based on usage and is called “Special Management Areas,” although, NPSA waters are not specifically protected above and beyond other waters in the territory. Special management areas within the territory’s open coastal waters include Fagatele Bay National Marine Sanctuary, the Territorial Marine Park on Ofu and NPSAs Ofu unit. Marine waters are classified by their type, embayment, open coastal, or ocean waters, for which a designated use is described. At this time, only Pago Pago Harbor, an area not within NPS boundaries, has been designated as impaired by the American Samoa Environmental Protection Agency (ASEPA). The ASEPA water quality standards designate wetlands separately from surface waters which may be Class 1 or Class 2. Groundwaters are classified as 1G when potable and 2G if the natural salinity exceeds 10,000 mg/L. The ASEPA water quality standards are available at http://www.epa.gov/ost/standards/wqslibrary/territories/american_samoa_9_wqs.pdf.

CULTURAL ISSUES

- Oral history (myths and legends)
- Traditional medicines
- Samoan culture
- Archeological sites (house foundations, masi pits, star mounds, grinding stones)

The current focus of the park is mainly on natural resources; however NPSA must exert care in preserving its limited cultural elements. The idea of preservation to the Samoan people has its pros and cons. The Samoans start to loose their culture if they do not talk and share their experiences. Taking advantage of modern technology by recording their culture including village history, county composition, and the relationships between the village in a district and the whole island would be beneficial. The oral history should be preserved for future generations of Samoan people. NPSA continues to monitor the progress of the trail work to insure that archaeological artifacts and sites are not impacted. NPSA plans to install wayside exhibits on parts of the trail. This is beneficial for visitors to understand the historical background behind each different feature, which includes fale foundations (house foundations), masi pits (fermented breadfruit/banana) circular depressions, pigeon/star mounds, grinding stones, and adze quarries.

MANAGEMENT ISSUES

Park Management

At NPSA, the implementation of resource management strategies, both natural and cultural, is important. “Through scientific research, NPS will continue to accumulate data on the natural and cultural resources of this national park and will regularly monitor those resources in order to detect or predict any changes in their condition. Studies are underway or have already been completed to accumulate baseline information and data on the park's botany, flying foxes, archeology, ethnography, and coral reefs”.

Park management documents (General Management Plan, Resource Management Plan, etc.) are available on-line at the NPS intranet site (www1.nrintra.nps.gov/im/units/pacn/parks/mgmt_docs.htm). This website is available only from NPS computer networks. Inquiries about public access should be directed to the park.

Vegetation: The removal of weeds and restoration of forest areas that have not recovered due to past human activities (e.g., abandoned plantations with invasive weeds preventing establishment of a native forest canopy) is an important management issue.

Terrestrial Vertebrates: Monitoring of the forest to track trends over time in diversity and structure and populations of bird and bat species plays an important role to ensure forest health.

The worldwide population of seabirds is declining, thus it is essential to study the status and trends of nesting seabirds on Mt. Lata. Monitoring rare species such as the sheath-tailed bat and spotless crane to track any population changes is another important issue for NPSA.

Terrestrial invertebrates: Trends of the endangered and threatened land snails should to be monitored as their predators (e.g. rats) could cause the demise of the population.

Marine Communities: In the marine environment, a major issue is decreasing the impacts of climate change on coral reefs. The park is experiencing increased incidences of coral bleaching and disease that is associated with increasing water temperatures. Identification of temperature-tolerant corals (e.g. corals in Ofu lagoon) is needed along with research on factors contributing to the temperature-tolerance of corals. Other major marine issues include overfishing, COTS damage to corals, and the demise of sea turtle populations in our region.

Invasive Species: The management and research on the effects of invasive species, in particular invasive trees, feral pigs, rats, and introduced snail and slug species is a priority and the incursion by new invasive species in areas adjacent to or external to the park.

Other Issues: A high priority for both terrestrial and marine programs is to develop a vital signs monitoring program to track changes in time.

INVENTORIES

Existing Inventories in Park

Vegetation: In 1975-1976, Amerson et al. conducted an extensive inventory in the territory which included 42 study plots in 16 vegetation communities and habitat types. A plant list of 489 species was recorded as well as vertebrate observations (1982).

Several plant inventories were conducted in NPSA and the territory of American Samoa by Whistler (1992, 1994, and 1995). These inventories include (1) a botanical inventory with detailed description of vegetation, rainforest, and disturbed vegetation in the park, includes voucher specimens which are kept at NPSA, and (2) a permanent forest plot which was established in NPSA in 1993, where 414 trees (49 species) were tagged. Additionally, botanical and ethnobotanical inventories were conducted between 2001 and 2002 in the park areas of Ofu, Olosega and Ta'u by Ragone and Lorence (2003). Voucher specimens of native and naturalized species and some cultivated plants were collected and kept at National Tropical Botanical Garden herbarium and duplicates stored at NPSA. The results of these inventories provided native flora species lists.

Plant diseases were collected and identified in the territory of American Samoa between October 1998 and July 2000. The lists include pathogen fungi, bacteria, nematodes, a mycoparasite, and one virus (Brooks 2000).

Terrestrial Vertebrates: A territory inventory of the terrestrial vertebrate wildlife and wildlife habit of American Samoa including park boundaries in Ta'u was conducted by Amerson et al. during 1975 and 1976. Fauna and flora species list were compiled and potentially threatened and endangered species were identified (1982).

An island-wide (Tutuila, Ofu, Olosega, and Ta'u) inventory, including NPSA, of seabird populations was conducted in 2002 by O'Connor and Rauzon (2003). This inventory will be used as a baseline for future comparisons of seabird populations.

There are only three native terrestrial mammals (Samoan fruit bat, White-naped fruit bat, and Sheath-tailed bat) in American Samoa. The first quantitative inventory in the territory was done in 1986 (Wilson & Engbring, 1992). Data collected consisted of non-replicated 30-min counts at 21 sites. The data is used to track population trends with other inventories conducted by the DMWR which indicates an overall decline in population (Craig et al. 1993).

A territory inventory of forest birds was conducted in 1989 by Engbring (1989). The inventory includes calculated densities of forest birds on each major island; incidental information on seabirds, waterbirds, introduced species, and migratory birds and identification of threatened or endangered species.

Terrestrial invertebrates: A checklist and bibliography of Samoan insects and related arthropods was compiled in 1997 by Kami and Miller (1998). The geographic coverage includes all the Samoan Islands (American and Western) and Swains Islands. Additional literature includes the *Insects of Samoa* series (9 volumes, 1927-1935) published by the British Museum (Natural History).

An inventory on the distribution and abundance of land snails and slugs in the park was conducted in 1998 by Cowie and Cook (1999). The particular focus was on the Partulidae group. Besides the previously identified 42 indigenous species, several species were recorded for the first time. In the native species, five new species were identified.

Marine Communities: An inventory of the coral reef community in Tutuila park unit was conducted by Green and Hunter (1998). Results of the inventory include recordings of 192 fish species and 85 coral taxa. Additional coral reef community inventories include (1) a territorial fish inventory was done by Wass (1984) includes a list of 991 fish species representing 113 families compiled. Pictures of the local fish in American Samoa are available on the NPSA website: www.nps.gov/npsa/, (2) fish list detailing family, genus species and minimum adult size was compiled by Green (2002) when she resurveyed the coral reefs of American Samoa, and (3) coral species list compiled by Fisk and Birkeland (2002) during their resurvey of the coral community.

Identifying and updating lists of coral species in the park is an ongoing project. An inventory of species is listed on the Coral Inventory section on NPSA website: www.nps.gov/npsa/. The list, although not completed, contains information on park status, abundance, residency and nativity.

Invasive Species: An inventory of marine invasives at various sites on Tutuila including NPSA occurred in 2002 by the Bishop Museum (Coles et al. 2003). The purpose was to detect past and recent introductions of marine species, and make recommendations for management and control. The findings show that there are relatively few introduced species in the waters of Tutuila and are not yet invasive or in coral reefs areas of the park.

Buffer Zone Inventories

Vegetation: As stated before, an extensive inventory in of the vegetation communities and habitat types was conducted by Amerson et al (1982), as well as plant diseases identified by Brooks (2002).

Terrestrial Vertebrates: Previously mentioned territory inventories include: (1) an island-wide inventory of seabird populations conducted by O'Connor and Rauzon (2004), (2) quantitative inventories of bat population in the territory was done by Wilson & Engbring (1992), (3) a territory inventory of forest by Engbring (1989), and (4) inventory of terrestrial vertebrate wildlife and wildlife habitat of American Samoa conducted by Amerson et al. (1982).

Terrestrial invertebrates: A list Samoan insects and related arthropods was compiled by Kami and Miller (1998). As the territory is small, these insects are likely to be found in the park boundaries.

Invasive Species: As mentioned, a territorial inventory of marine invasives occurred in 2002 by Coles et al. (2003).

Priorities for New Inventories in Park

Terrestrial and Marine Communities: Inventories of marine and terrestrial invertebrates are needed in all park units. Existing inventories of marine fishes and coral will be updated as new studies are conducted.

Invasive Species: An inventory of invasive plants in all park units is a priority.

MONITORING

Existing Monitoring in Park

Vegetation: Starting September 2004, a permanent forest plot will be established in Ta'u by Edward Webb. Plants will be identified, tagged, and measured for diameter. Plots will be resurveyed in two years for growth, mortality, and recruitment.

Terrestrial Vertebrates: Monitoring feral pig activity, ongoing since 1997, provides an index of pig activity and ecological effects.

DMWR has monitored forest birds since 1991 and bats since 1986 at various sites throughout the territory. Four monitoring sites are located within NPSA. Reports are available at DMWR.

Marine Communities: A monitoring program to assess the health of coral reef environment is currently being developed. Other territorial or federal agencies are conducting ongoing monitoring programs that have at least one monitoring site within the park's boundaries include a quantitative inventory of fish, corals, and selected macro-invertebrates (Green 2002, Fisk et al. 2002). Species lists were compiled as a result of these monitoring projects.

DMWR monitors annual harvests of fish and invertebrates to assess trends in resources. Monitoring for pelagic and bottomfish began in 1982, but monitoring of other artisanal and subsistence fisheries has been sporadic. Though the inventories are not conducted within park boundaries, it is an informative summary for the territory.

Water Quality: ASEPA has been monitoring water quality at the Amalau stream located in the park boundaries since May 2003. Monthly specimen collections are taken for field measurement and analysis for water quality. The data resides at the ASEPA.

Weather: The monitoring of the amount of rainfall at Mount Alava in NPSA along with eight additional sites outside NPSA on Tutuila was conducted by the U.S. Geological Survey between 2000 and 2002. The data collected provides information about availability of water resources of the island for water management issues or ecological studies. For more information on this survey go http://hi.water.usgs.gov/projects/project_samoa_gw.htm.

Buffer Zone Monitoring

Terrestrial Vertebrates: As previously mentioned, DMWR has monitored forest birds and bats throughout the territory.

Marine Communities: Long-term monitoring of the coral community in Fagatele Bay and Tutuila Island has been conducted by Birkeland et al. from 1985 to 2001. Coral abundance, colonies, species list were documented in addition to a fish species list. The surveys in 1998 and 2001 indicate an overall improvement in the condition of the reefs. In contrast to the coral community, the fish abundance has declined (Birkeland et al. 2004).

A monitoring project that is beneficial to coral reef monitoring is the 'Hotspot Satellite Maps for Sea Surface Temperature (SST)' conducted by NOAA. The data provides a useful means of alerting coral reef managers to areas that may become bleached due to warming SST.

Monitoring of water temperature, currents, coral and fish surveys in the waters of American Samoa was been conducted in 2002 and 2004 by NOAA. The monitoring project is scheduled to take place ever two years. As of yet, no data has been provided.

Also mentioned earlier, DMWR monitors annual harvests of fish and invertebrates to assess trends in resources.

Invasive Species: Invasive tree and plant distributions/monitoring are currently being initiated.

Water Quality: Since 2001, ASEPA has been monitoring beach water quality in Tutuila to determine if the beach is safe for swimming. If the beach is unsafe for swimming a notice is published in the local newspaper.

Climate: The Pago Airport Station has been recording air temperature and rainfall since about 1975. The data is useful for tracking changes.

Another station in American Samoa that records temperature, carbon dioxide, and other data is the Samoa Observatory located on Cape Matatula. This is long-term monitoring of the world's air quality. For more information go to <http://www.cmdl.noaa.gov/obop/smo/>.

As mentioned above, the monitoring of rainfall on Tutuila was conducted by U.S. Geological Survey.

CONCLUSION

NSPA unique features are its paleotropical rainforests and Indo-Pacific coral reefs. Natural and important resources include forest pollinators (flying foxes and bats), rare species (sheath-tailed bat, Pacific booby, spotless crane, fruit dove), coral reef community, sandy and rocky beaches, wetlands and streams, rainforests, and cloud forests. Primary threats to these resources include tropical cyclones, high fishing pressure, coral bleaching and mortality due to global warming, rapid population growth, expansion of agriculture into primary rainforest, and invasive species.

Management priorities of this new National Park are to preserve rainforest and coral reefs while maintaining traditional land use; subsistence agriculture and fishing are permitted within the park.

REFERENCES

Amerson, A. Binion, W. Arthur Whistler, and Terry D. Schwaner. 1982. Wildlife and wildlife habitat of American Samoa. I. Environment and ecology. United States Department of the Interior. U.S. Fish & Wildlife Service, Washington, D.C., USA.

Amerson, A. Binion, W. Arthur Whistler, and Terry D. Schwaner. 1982. Wildlife and wildlife habitat of American Samoa. II. Accounts of flora and fauna. U.S. Fish & Wildlife Service, Washington, D.C., USA.

Birkeland, Charles, Alison Green, Craig Mundy, and Karen Miller. 2004. Long term monitoring of Fagatele Bay National Marine Sanctuary and Tutuila Island (American Samoa) 1985 to 2001: summary of surveys conducted in 1998 and 2001.

Brooks, Fred. 2000. List of Plant Diseases in American Samoa. 2000. Land Grant Technical Report 31.

Coles, S. L., P. R. Reath, P. A. Skelton, V. Bonito, R.C. DeFelice, and L. Basch. 2003. Introduced marine species in Pago Pago Harbor, Fagatele Bay and the National Park Coast, American Samoa. Bishop Museum Pacific Biological Survey. Bishop Museum Technical Report No. 26. Bishop Museum, Honolulu, Hawaii, USA.

Cowie, Robert H. and Robert P. Cook. 1999. The distribution and abundance of land snails in the National Park of American Samoa, with particular focus on partulidae. Cooperative National Park Resources Studies Unit. Technical Report 125. University of Hawaii at Manoa, Honolulu, Hawaii, USA.

Craig, Peter, Pepper Trail, and Thomas Morrell. 1993. The decline of fruit bats in American Samoa due to hurricanes and overhunting. *Biological Conservation* **69**:261-266.

Engbring, John. 1989. A 1986 survey of the forest birds of American Samoa. U.S. Fish and Wildlife Service, Pago Pago, American Samoa.

Fisk, David and Charles Birkeland. 2002. States of coral communities on the volcanic islands of American Samoa. Department of Marine and Wildlife Resources, Pago Pago, American Samoa.

Green, Alison. 2002. Status of coral reefs on the main volcanic islands of American Samoa: a resurvey of long term monitoring sites (benthic communities, fish communities, and key macroinvertebrates). Department of Marine and Wildlife Resources, Pago Pago, American Samoa.

Green, Alison and Cynthia Hunter. 1998. A preliminary survey of the coral reef resources in the Tutuila unit of the National Park of American Samoa.

Kami, Karin S. and Scott E. Miller. 1998. Samoan insects and related arthropods: checklist and bibliography. Bishop Museum Technical Report No. 13. Bishop Museum, Honolulu, Hawaii, USA.

O'Connor, Paul J. and Mark J. Rauzon. 2003. Inventory and monitoring of seabirds National Park of American Samoa. Technical Report 132. University of Hawaii at Manoa, Honolulu, Hawaii, USA.

Ragone, Diane and David Lorence. 2003. Botanical and ethnobotanical inventories of the National Park of American Samoa Ofu, Olosega, Ta'u, and {Manu'a' Islands} and Tutuila Island. Pacific Cooperative Studies Unit. National Tropical Botanical Garden, Kalaheo, Kauai, Hawaii, USA.

Wass, Richard C. 1984. An annotated checklist of the fishes of Samoa. NOAA Technical Report NMFS SSRF-781. National Oceanic and Atmospheric Administration. National Marine Fisheries Service, Rockville, MD, USA.

Whistler, W. Arthur. 1992. Botanical inventory of the proposed Ta'u unit of the National Park of American Samoa. Cooperative National Park Resources Studies Unit. Technical Report 83. University of Hawaii at Manoa, Honolulu, Hawaii, USA.

Whistler, W. Arthur. 1994. Botanical inventory of the proposed Tutuila and Ofu units of the National Park of American Samoa. Cooperative National Park Resources Studies Unit. Technical Report 87. University of Hawaii at Manoa, Honolulu, Hawaii, USA.

Whistler, W. Arthur. 1995. Permanent forest plot data from the National Park of American Samoa. Cooperative National Park Resources Studies Unit. Technical Report 98. University of Hawaii at Manoa, Honolulu, Hawaii, USA.

Whistler, W. Arthur. 2000. Plants in Samoan culture: The ethnobotany of Samoa. Isle Botanica, Honolulu, Hawaii, USA.

Whistler, W.A. 2002. The Samoan rainforest. A guide to the vegetation of the Samoan Archipelago. Isle Botanica, Honolulu, Hawaii, USA.

Wilson, D. and J. Engbring. 1992. *Pteropus samoensis* and *Pteropus tonganus*: status in Fiji and Samoa. Pages 74-101 in D. E. Wilson and G. L. Graham, eds. Pacific island flying foxes: proceedings of an international conservation conference. U.S. Fish Wildl. Serv., Biol. Rep. 90(23).